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Lawrence Livermore
National Laboratory

STEP

Science & Technology Education Program

S Science &
T Technology
E Education
P Program

Science Education in the National Interest

Annual Report FY02 Overview

Cover photos

Top: The three LLNL College Cyber Defenders students in FY02. (Page 16)

Center: The construction of the Edward Teller Education Center building in Livermore. (Page 88)

Bottom Left: Senator John Glenn with MARA and ROTC participants during an FY02 visit to LLNL. (Page 55)

Bottom Right: Hal Graboske, acting Deputy Director for Science and Technology, chats with a UC Berkeley student at the 2002 Student Research Symposium. (Page 110)

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National Nuclear Security Administration

Overview

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Introduction

The Science and Technology Education Program (STEP) at Lawrence Livermore National Laboratory (LLNL) serves as a resource to students, teachers, and faculty by facilitating research interactions with Livermore's world-class scientific facilities and staff. STEP also supports the science-educational needs of the local and regional communities surrounding the Laboratory.

STEP's programs and projects are directed toward

- facilitating research internships for college students entering careers important to the intellectual capability required by the Laboratory's national-security mission and
- enhancing science-education and -literacy activities through partnerships with the local and regional K–14 academic institutions surrounding the Laboratory.

The programs and projects that support these goals are discussed in detail on the STEP Web site at http://step.llnl.gov/. The common theme of STEP's science-education efforts is integrating education, research, and career options at all school levels—pre-college, undergraduate, and graduate school.

During FY02, STEP's college research internships hosted 170 college, university, and military academy students participating in one or more research programs at LLNL, as listed in Table 1.

Table 1: FY02 College Student Research Internships

Internship Projects	Number of Interns
National Nuclear Security Administration/Defense Programs/Office of University Partnerships—Laboratory Critical Skills Development Program	
Advanced Simulation and Computing Pipeline	15
College Cyber Defenders	3
Inertial Confinement Fusion Experimental Internships	7
Interns for Defense Technologies	11
Internships in Terascale Simulation Technology	48
Laser Science and Technology Student Program	5
National Ignition Facility Laser Internships	1
Nuclear Science Internship Program	15
Systems Administration Computer Support	5
LLNL National-Security Directorates	
Computational Materials Science and Chemistry Summer Institute	11
High-Energy-Density Physics Program	14
LLNL National Security Office	
Military Academic Research Associates	24
Reserve Officer Training Corps	11
Total	170

During FY02, STEP's science-outreach and teacher-education projects engaged approximately 13,000 students and 1,000 teachers, as listed in Table 2.

Table 2: FY02 K–14 Education Projects

Science Outreach (K–12 Students)	Number of Participants
California State Summer School for Mathematics and Science	30
Crystals for the Classroom	90
Expanding Your Horizons	983
Explorer Post	10
Exploring Your Future Conference	360
Fun With Science	8,980*
Future Scientists and Engineers of America	75
Math Challenge	100
Science on Saturday	1,700*
Student Research Academy	25
Tri-Valley Science and Engineering Fair	272
Total	12,625

K–14 Education (Teachers)	Number of Participants
Computer Technology Workshops	200
Crystals for the Classroom	2
Educational Partnerships	100
Edward Teller Science Education Symposium	125
Faculty Research Experiences	4
Great Explorations in Math and Science	72
Groundwater Monitoring and Assessment Program	60
Laser Science and Optics in the Classroom	20
Promoting Achievement Through Hands-On Science	320
Teacher Research Academy	10
University of California/Community College/Central Valley Education	120
Web Tech Academy	19
Total	1,052

*Teachers, parents, and students

Critical Skills Internships for College Students (Section 1)

Most of the college internships listed in Table 1 are funded directly by the National Nuclear Security Administration (NNSA)/Defense Programs (DP)/Office of University Partnerships (OUP) through its Laboratory Critical Skills Development Program. College students are recruited for these internships to support the specific recruiting needs of the Laboratory's NNSA programs.

These internship projects target undergraduate and graduate college students with "critical skills" in four major disciplines: chemistry and materials science, computer science, engineering, and physics and are managed within Livermore's Critical Skills Internship Program (CSIP) (http://csip.llnl.gov/).

The DP/OUP-funded projects described in Section 1 resulted in 27 of the 236 students who have participated in internships during the last three fiscal years (FY00–FY02) being hired into either flex-term or career positions at LLNL. This represents a student hiring rate of 10–15% per fiscal year.

Appendix 1 summarizes how STEP and the sponsoring technical organizations offer student interns a number of lectures and seminars to help the interns develop their research and career goals. All events offered to the interns are based on the Laboratory's mission-oriented sciences.

As explained in Appendix 3, student interns are given the opportunity to have their school and LLNL research accomplishments listed on the CSIP student portfolio Web site (http://internships.llnl.gov/portfolio/).

Appendix 4 describes the end-of-summer evaluation of each internship project listed in Table 1. The purpose of the assessments is to provide both individual and collective evaluations of the programs. Assessment tools include measuring student learning, measuring student satisfaction or ratings of the internship experience, and evaluating the program administration.

STEP also assists various program elements within the Laboratory's Stockpile Stewardship Program, such as computational materials science and high-energy-density physics (HEDP), in developing recruiting programs within the critical skills of interest to each sponsoring element.

For example, Section 1 explains how the successes of the FY01 and FY02 HEDP Program led LLNL to conduct a HEDP Summer School (HEDPSS) aimed at staff researchers who are new to the field, advanced graduate students, and postdoctoral researchers. The 2002 HEDPSS (http://www.llnl.gov/adiv/HEDPSS/) took place from August 4 to 16 at the University of California (UC) at Santa Cruz and was cosponsored by the UC Santa Cruz Department of Astronomy and Astrophysics and the Hertz Foundation.

Military Academic Research Associates/Reserve Officer Training Corps (Section 2)

STEP also works with Livermore's National Security Office to contribute to common mission goals between the Department of Defense (DoD) and the Department of Energy (DOE) by providing internship opportunities for college students in the Reserve Officer Training Corps (ROTC) and U.S. military academy cadets and midshipmen.

Section 2 describes the Laboratory's ROTC Day, which is part of the continuing efforts of Livermore's National Security Office to strengthen the relationship between LLNL and DoD. ROTC Day is a component of the ROTC internship project, where cadets and midshipmen participate in internships at national-security laboratories (Livermore; Los Alamos National Laboratory [Los Alamos]; Sandia National Laboratories; and recently, Oak Ridge National Laboratory and Idaho National Engineering and Environmental Laboratory).

Science Outreach and K–14 Education (Section 3)

Livermore's K–14 science-education and -literacy activities play an important role in the creation of future scientists, engineers, and technicians in areas of special interest to the Laboratory.

Through local and regional education partnerships, STEP leads the Laboratory's education efforts to stimulate greater interest in science and science careers. These science-outreach and educator projects are funded by the Laboratory's general and administrative distributed budget.

Section 3 describes the objectives and accomplishments of the student and teacher projects listed in Table 2. One example is Educator Day, where K–14 educators and state legislative representatives from throughout the San Joaquin Valley attended presentations highlighting Laboratory resources that are available to support science instruction. Educator Day participants learned that Merced College has sent faculty members to Livermore for sabbaticals and that STEP has established a scientific-equipment loan program with Merced College. The equipment will be used to develop student training programs in optics, biotechnology, environmental science, and computer science technology.

Edward Teller Education Center (Section 3)

The Edward Teller Education Center (ETEC) (http://etec.das.ucdavis.edu) is a UC collaborative that was established to provide professional-development instruction in science and technology to K–14 teachers. ETEC is funded by the UC Office of the President and is operated by UC Davis, UC Merced, and LLNL.

Section 3 describes how STEP and ETEC have collaborated to offer a variety of K–14 teacher professional-development programs on topics ranging from computer technology to basic research. Moreover, STEP recently helped ETEC receive a $50,000 grant from Washington Mutual Bank to support teacher professional development in California rural communities, such as the San Joaquin Valley and Central Valley, by providing stipends for teachers to attend workshops cosponsored by STEP and ETEC.

Institutional Education Activities (Section 4)

STEP continues to take the lead in facilitating and piloting numerous educational initiatives at LLNL. STEP leads Livermore's Institutional Education Committee, which combines efforts throughout the Laboratory to promote student activities. STEP also maintains a Web site (http://www.llnl.gov/education) that provides updates about all LLNL opportunities for students and faculty.

Section 4 describes how STEP helps students prepare for graduate schools and future careers. For example, STEP acquired a site license for the test-preparation software, GRE PowerPrep, enabling STEP to offer the software to students free of charge. The opportunity to download the software, as well as 34 other career-enhancing seminars, workshops, etc. for students, is listed on STEP's Student Bulletin Board at http://step.llnl.gov/sbb.

A major institutional education activity managed by STEP is the LLNL Student Research Symposium (http://step.llnl.gov/symposium). The FY02 symposium included a program book of abstracts (UCRL-MI-149475) for all participants.

As shown in Appendix 2, the symposium posters were displayed by discipline: biology (7), chemistry and materials science (13), computation (19), engineering (14), environmental science (4), and physics (9), as well as four late submissions. Symposium attendees included students,

Laboratory employees, and recruiting representatives from UC Davis and the ASCI Alliance campuses (the University of Chicago, the University of Illinois, Stanford University, and the California Institute of Technology).

Directions for FY03

STEP's college internships and K–14 activities have been fully integrated into the Laboratory's University Relations Program (URP) and are defined as a URP program element similar to other URP-managed programs (http://www.llnl.gov/urp/). This integration process began in FY02 and was completed in the first quarter of FY03.

To better communicate the alignment of the college internship projects with the mission needs of Livermore's NNSA programs, the corresponding program element within URP has been renamed CSIP, with Barry Goldman serving as the manager.

For FY03, CSIP projects have been codesigned by principal investigators in the Stockpile Stewardship Program to leverage their efforts to increase the number of U.S. citizen scientists and engineers available to fill critical-skills needs within NNSA programs. The CSIP projects for FY03 were evaluated for overlap with the structure of the DOE/DP Campaigns.

As part of the strategy to achieve the critical-skills recruiting goal, CSIP internship projects (http://internships.llnl.gov) in FY03 continue to target undergraduate and graduate college students within four core competencies: chemistry and materials science, computer science, engineering, and physics. These four disciplines are aligned with the stockpile-stewardship critical-skills list, created by Livermore and Los Alamos as part of the "Appendix O" discussions between UC and the NNSA.

To better align the K–14 science education and outreach activities with the needs of the local and regional communities surrounding LLNL, existing collaborations have been strengthened, and new collaborations are being established, including those that address California's statewide science-education topics.

Moreover, during FY03, STEP's K–14 manager, Richard Farnsworth, and the ETEC director, Stan Hitomi, will expand the use of STEP's student and teacher projects as a leveraging instrument for UC K–12 education partnerships (http://www.universityofcalifornia.edu/collegeprep/welcome.html). Because ETEC is a collaboration between UC Davis, UC Merced, and LLNL, STEP has already expanded its local education activities into California's Central Valley by combining resources with ETEC.

The Laboratory's continuing commitment to education has roots in the close relationship between LLNL and the UC system and through the realizations that (1) Livermore's leading-edge research requires the development of specific critical skills not readily available from universities and (2) the Laboratory can be a contributing partner in helping to solve the many challenges facing K–12 science education. LLNL is looking forward to further supporting the goals of NNSA/DP and continuing its role as a major contributor to the critical-skills recruitment efforts of the NNSA programs.